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**Stem cells and biopharmaceuticals: vital roles in the growth of tissue-engineered small intestine.**

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<b>Authors:</b>	Gustavo Gross Belchior, Mari Cleide Sogayar, Tracy Cannon Grikscheit
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**Public Summary:**

Tissue engineering currently constitutes a complex, multidisciplinary field exploring ideal sources of cells in combination with scaffolds or delivery systems in order to form a new, functional organ to replace native organ lack or loss. Short bowel syndrome (SBS) is a life-threatening condition with high morbidity and mortality rates in children. Current therapeutic strategies consist of costly and risky allotransplants that demand lifelong immunosuppression. A promising alternative is the implantation of autologous organoid units (OU) to create a tissue-engineered small intestine (TESI). This strategy is proven to be stem cell and mesenchyme dependent. Intestinal stem cells (ISCs) are located at the base of the crypt and are responsible for repopulating the cycling mucosa up to the villus tip. The stem cell niche governs the biology of ISCs and, together with the rest of the epithelium, communicates with the underlying mesenchyme to sustain intestinal homeostasis. Biopharmaceuticals are broadly used in the clinic to activate or enhance known signaling pathways and may greatly contribute to the development of a full-thickness intestine by increasing mucosal surface area, improving blood supply, and determining stem cell fate. This review will focus on tissue engineering as a means of building the new small intestine, highlighting the importance of stem cells and recombinant peptide growth factors as biopharmaceuticals.

**Scientific Abstract:**

Tissue engineering currently constitutes a complex, multidisciplinary field exploring ideal sources of cells in combination with scaffolds or delivery systems in order to form a new, functional organ to replace native organ lack or loss. Short bowel syndrome (SBS) is a life-threatening condition with high morbidity and mortality rates in children. Current therapeutic strategies consist of costly and risky allotransplants that demand lifelong immunosuppression. A promising alternative is the implantation of autologous organoid units (OU) to create a tissue-engineered small intestine (TESI). This strategy is proven to be stem cell and mesenchyme dependent. Intestinal stem cells (ISCs) are located at the base of the crypt and are responsible for repopulating the cycling mucosa up to the villus tip. The stem cell niche governs the biology of ISCs and, together with the rest of the epithelium, communicates with the underlying mesenchyme to sustain intestinal homeostasis. Biopharmaceuticals are broadly used in the clinic to activate or enhance known signaling pathways and may greatly contribute to the development of a full-thickness intestine by increasing mucosal surface area, improving blood supply, and determining stem cell fate. This review will focus on tissue engineering as a means of building the new small intestine, highlighting the importance of stem cells and recombinant peptide growth factors as biopharmaceuticals.

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